

## DEVICE FOR IMPACT SENSING

## Background of the Invention

The present invention is based on a device for impact sensing of the general type indicated in the independent patent claim.

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From DE 101 45 698 A1, a sensor system for a vehicle is known in which acceleration sensors are situated on the bumper.

## Advantages of the Invention

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In contrast, the device according to the present invention for impact sensing having the features of the independent patent claim has the advantage that the acceleration sensor mechanism is situated between the crossmember of the bumper and the

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bumper fascia. A fixed connection of the acceleration sensor mechanism to the bumper fascia is particularly advantageous.

Due to the installation location behind the bumper fascia, a reliable acquisition of acceleration signals is possible. The device according to the present invention is particularly

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well-suited for recognizing pedestrians. The installation of the acceleration sensor mechanism in the bumper takes

advantage of the fact that in the case of an accident

involving a pedestrian the signal strength there increases significantly, because the acceleration sensor mechanism is

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situated closer to the point of impact, while on stretches of bad road the signal strength decreases due to a decoupling from the chassis. Accordingly, the installation location according to the present invention achieves a reliable and rapid recognition of a collision with a pedestrian.

Through the measures and developments stated in the dependent claims, advantageous improvements of the device for impact sensing indicated in the independent patent claim are

5 possible.

It is particularly advantageous that the acceleration sensor mechanism has two acceleration sensors that are attached to the bumper fascia with an offset to the center of the vehicle.

10 In this way, it is advantageously possible to reliably recognize a collision with a pedestrian that does not take place centrically. In addition, the position of the impact can be determined. Furthermore, it is advantageous that at least one additional sensor mechanism is situated on the bumper.

15 This can include for example a piezo cable having an integrated capacitive sensor, capable of recognizing not only a collision but also an approach to an obstacle. Due to the combination of various sensor mechanisms, an even more reliable recognition of an impact with a pedestrian is  
20 possible. Distinguishing between a pedestrian and some other collision object is also made particularly simple.

Normally, the acceleration sensor mechanism for acquiring accelerations is configured in the longitudinal direction of  
25 the vehicle (x direction); however, it is possible to use a different sensing direction, for example the transverse direction of the vehicle (y direction) or the vertical direction (z direction), or the x/y direction (angled), or an arbitrary combination of sensors in various directions.

30 Finally, it is also advantageous that the device is connected to a control apparatus for controlling equipment for protecting persons, so that the control apparatus controls the protective equipment dependent on signals from the

acceleration sensor mechanism and additional sensor mechanisms. In particular, besides the signal from the acceleration sensor mechanism, a signal representing the vehicle's inherent speed, or its speed relative to the collision object, can also be used.

#### Drawing

Exemplary embodiments of the present invention are shown in the drawing, and are explained in more detail in the following description.

Figure 1 shows a top view of the device according to the present invention, and

Figure 2 shows a block diagram.

#### Description

Due to new legislation in the European Union, automobile manufacturers are now required to reduce injuries to pedestrians in collisions with vehicles. This can be achieved on the one hand by constructing the front of the vehicle in such a way that the pedestrian is less seriously injured in such a collision. Thus, a passive solution is available. However, if the passive solution is not sufficient, or is rejected as unsatisfactory, an active solution is pursued. Here, a sensor mechanism is used to recognize the impact with a pedestrian, and the protection of the pedestrian is then achieved by triggering suitable protective equipment, such as external airbags, or lifting the hood.

In this active solution, various sensor designs can be used. These include in particular the acceleration sensor.

Acceleration sensors are already installed in the front of the vehicle in order to act as what are known as up-front sensors. These are installed for example on the radiator supports.

However, for protecting pedestrians this has the disadvantage that potholes, curb stones, and other uneven features of a road generate signals and amplitudes similar to those produced in a collision with a pedestrian. It is therefore fairly difficult to distinguish between an accident involving a pedestrian and uneven features of the road.

According to the present invention, it is therefore proposed to situate acceleration sensors between the bumper fascia and the crossmember of the bumper. In this way, when there is a collision with a pedestrian the signal is particularly high, and the decoupling from the chassis is such that stretches of rough roadway and potholes generate only a low signal.

With the aid of the device according to the present invention and a suitable evaluation of the signals produced by the device, it is possible to distinguish between a collision with a pedestrian and traveling over a section of bad road, as well as other cases of false activation.

In principle, the device according to the present invention operates with one acceleration sensor; however, it is advantageous to use two acceleration sensors having an offset to the right and to the left, for example positioned 60cm from the center of the vehicle, in order to reliably recognize pedestrian impacts that do not take place centrally and to deliver positional data. Of course, it is possible to provide still more acceleration sensors in order to achieve an even more precise resolution.

In addition, it is possible to combine one or more acceleration sensors behind the bumper fascia with other sensors, such as for example a piezo cable or acceleration sensors at other installation locations, such as a central  
5 sensor, or sensors fastened to crossmembers or having other directions of measurement, for example in the vertical direction of the vehicle. Likewise, the knowledge of the vehicle's inherent speed, for example via the CAN bus, or of its relative speed, for example via an environmental sensor  
10 mechanism, can also be taken into account in the decision for the triggering of the protective equipment.

There are various possible ways of using the measured signals for up-front sensing. For example, information concerning the  
15 type of barrier (hard, soft, offset or complete coincidence), the relative speed between the automobile and the object, and the exact point in time of the impact can be used by the airbag algorithm.

20 Figure 1 shows a top view of the device according to the present invention. A bumper fascia 10 is situated in front of a foam 11 and crossmember 12. Acceleration sensors 14 are attached to bumper fascia 10, between bumper fascia 10, foam 11, and/or crossmember 12. In addition, here it is also  
25 possible to provide additional acceleration sensors 13, as is done here for example on crossmember 12, one of the acceleration sensors also being capable of acquiring accelerations in the z direction. Acceleration sensors 14 acquire accelerations in the longitudinal direction of the  
30 vehicle.

Figure 2 visually represents the functioning of the device according to the present invention. The sensor signals of an acceleration sensor 20 that is situated at the left in the

bumper, of a second acceleration sensor 21 situated at the right in the bumper, and of a central acceleration sensor 22 situated in the airbag ECU, as well as an item of information relating to speed 23, are supplied to a control apparatus 24  
5 having a data evaluation unit 25 and a function for distinguishing between pedestrians and stretches of bad roadway 26, in order to determine whether protective equipment such as an external airbag or an active engine hood should be controlled. Besides the sensor inputs shown here, other sensor  
10 inputs are also possible. It is also possible to use fewer sensors than are indicated.